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RESEARCH ARTICLE

CORONAVIRUS AND THE INCREASE IN HEART DISEASE AFTER VACCINES

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Abstract

Introduction: The Covid-19 epidemic began in the city of Wuhan, China, in December 2019, but quickly spread to the world. The main theories raised included contact between a human being and an infected animal and an accident in a laboratory in China. Science rushed to create a vaccine against the disease, and the first immunizers were ready in mid-2020. Until then, it took more than 10 years for a vaccine to be ready, while the one that fights Covid-19 reached people's arms in months. This rapid production has meant that even today we still have doubts about the harmful effects of Covid-19 vaccines.

Objectives: To discuss, through a literature review, some studies on the influence of vaccines on the increase in heart disease after Covid-19.

Material and Methods: This article is a systematic review, based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, which seeks to identify the obstacles to achieving Coronavirus therapy and the increase in heart disease after vaccines, by analyzing pre-conducted studies.

Literature review: In most of the studies observed by this review, there was no relationship between Covid-19 vaccines and an increase in heart disease. Some studies suggest that a pro-thrombotic syndrome has been described in a small number of individuals after being vaccinated.

Final considerations: The adverse effects of Covid-19 vaccines are mild in most of the studies analyzed, they are common and do not pose

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any risk. However, it was also mentioned that there is no vaccine or drug without any associated adverse effects.

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Introduction:-

Covid-19 is a disease that can affect the entire cardiovascular system. It is an infectious disease caused by a virus, but it is also an inflammatory disease (BADAM et.al, 2023).

According to Lopes et.al (2022), the individual affected by Covid-19 develops a very important inflammatory reaction. And this inflammation can affect not only the heart muscle, but the entire cardiovascular system (arteries, veins and organs associated with the cardiovascular system).

According to Tomaz et al (2023), after the Covid-19 pandemic there was an increase in the number of hypertensive patients. There has been an increase in the number of people with uncontrolled hypertension post-Covid.

What we have seen in the offices is that, after Covid-19, the patient who was not hypertensive has become hypertensive and the patient who was controlled hypertensive has had very uncontrolled blood pressure that is difficult to control (VASUDEVA et.al, 2022).

However, something that still leaves doubts is whether there is a relationship between the increase in heart disease and the use of Covid-19 vaccines.

Objectives:-

To discuss through a literature review some studies on the influence of vaccines on the increase in heart disease after Covid-19.

Material And Methods:-

This article is a systematic review, based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, which seeks to identify the obstacles to achieving Coronavirus therapy and the increase in heart disease after vaccines, by analyzing pre-conducted studies.

A search strategy was developed based on the evaluation of an objective on the subject in question, which forms the basis of the study.

The search descriptors were selected from the Descriptors in Health Sciences (DeCS) website and then combined with the Boolean operator "AND". The databases used for the search were: PubMed and the Virtual Health Library (VHL), which evaluated cross-sectional, cohort and case-control studies from 2019 to 2023, in Portuguese, English and Spanish.

The inclusion criteria were cross-sectional studies that were freely available and focused on the subject in question.

The exclusion criteria were studies conducted before 2019 or which did not relate Covid vaccines to heart disease.

In total, the result of the search in the databases using the descriptors, but without the application of filters, resulted in 121 articles available. After applying the following filters, PubMed: search periods between 2019 and 2023, Portuguese, English and Spanish language and type of literature being a cross-sectional study. VHL: search periods between 2019 and 2023, Portuguese, English, Spanish language and type of literature being an observational study, a total of 22 articles were selected.

Literature Review:-

Types of Covid-19 vaccines used in Brazil

Four vaccines against Covid-19 have received authorization from the National Health Surveillance Agency (Anvisa) for use in Brazil: CoronaVac, a vaccine from Butantan produced in partnership with the Chinese biopharmaceutical

company Sinovac, and immunizers from the companies AstraZeneca, Pfizer and Janssen, and have been used in the Ministry of Health's National Immunization Program (PNI) (SARINHO et.al, 2021).

Vaccine characteristics

CoronaVac

Butantan's vaccine uses inactivated (killed) virus technology, a technique that has been consolidated for years and has been widely studied. When injected into the body, this virus is not capable of causing disease, but induces an immune response. The clinical trials of CoronaVac (FIGURE 1) in Brazil were carried out exclusively with health professionals, people with high exposure to the virus (BEE et.al, 2022).

Figure 1:- Coronavac vaccine. Source: Butantan.gov.br (2021).

Astra Zeneca

It was developed by the pharmaceutical company AstraZeneca (FIGURE 2) in partnership with the University of Oxford. In Brazil, it was produced by the Oswaldo Cruz Foundation (Fiocruz). The technology employed is the use of a so-called viral vector. The adenovirus, which infects chimpanzees, is genetically manipulated so that the gene for the "Spike" protein ("S" protein) of Sars-CoV-2 is inserted (SARINHO et.al, 2021; BEE et.al,2022).

Figure 2:- Vaccine from AstraZeneca Pharmaceuticals. Source: Astrazenaca.com (2021).

Pfizer

The immunizer from the pharmaceutical company Pfizer (FIGURE 3) in partnership with the BioNTech laboratory is based on messenger RNA technology, or mRNA. Synthetic messenger RNA gives the body instructions for producing proteins found on the surface of the novel coronavirus, which stimulate the immune system's response (SARINHO et.al, 2021; BEE et.al,2022).

Figure 3:- Pfizer vaccine. Source: Pfizer.com (2021).

Janssen

From the Johnson & Johnson group, the vaccine from the Janssen laboratory (FIGURE 4) is administered in just one dose. Like Astrazeneca's immunizer, it also uses viral vector technology, based on a specific type of adenovirus that has been genetically modified so that it does not replicate in humans (SARINHO et.al, 2021; BEE et.al,2022).

Figure 4:- Vaccine from the Janssen laboratory. Source: Janssen.com (2021).

1. Side effects of Covid-19 vaccines
2. Like any vaccine, Covid-19 vaccines can cause side effects, most of which are mild or moderate and disappear within a few days on their own. As shown in the results of clinical trials, more serious or long-lasting side effects are possible. Vaccines are continuously monitored for adverse events (SARINHO et.al, 2021; BEE et.al,2022).
3. The reported side effects of Covid-19 vaccines have mostly been mild to moderate and have not lasted more than a few days. Typical side effects include pain at the injection site, fever, fatigue, headache, muscle pain, chills and diarrhea. The chances of any of these side effects occurring after vaccination differ according to the specific vaccine Covid-19 vaccines only protect against the SARS-CoV-2 virus, so it is still important to stay healthy and well (BEE et.al,2022).

Less common side effects

According to Cavilha et.al (2022), upon receiving the vaccine, a person should stay for 15 to 30 minutes at the vaccination site so that healthcare professionals are available in case of immediate reactions. Individuals should alert their local healthcare providers after vaccination if they experience any unexpected side effects or other health events - such as side effects lasting more than three days. Less common side effects reported for some Covid-19 vaccines have included severe allergic reactions, such as anaphylaxis; however, this reaction is extremely rare.

Brazilian national authorities and international bodies are closely monitoring any unexpected side effects following the use of the Covid-19 vaccine (DO NASCIMENTO et.al, 2020).

Long-term side effects

Side effects usually occur in the first few days after getting a vaccine. Since the start of the first mass vaccination program in early December 2020, hundreds of millions of vaccine doses have been administered (DO NASCIMENTO et.al, 2020; BEE et.al,2022).

After vaccination, it usually takes a few weeks for the body to build up immunity against sars-CoV-2, the virus that causes Covid-19. So it's possible that a person could be infected with SARS-CoV-2 shortly before or after vaccination and still get sick with Covid-19. This is because the vaccine has not yet had enough time to provide protection (BERNIS, et.al, 2022).

Experiencing side effects after vaccination means that the vaccine is working and your immune system is responding as it should.

Cardiac effects of the Covid-19 vaccine, discussion of studies

The Scientific Committee of the Brazilian Society of Cardiology, by determination of its Board of Directors, convened a working group to monitor and organize, on an ongoing and systematic basis, scientific evidence of the cardiovascular safety of Covid-19 vaccines (FEITOSA et.al, 2020; GOMES et.al, 2022).

According to De Freitas et.al (2021), inflammation directly affects the heart muscle, resulting in myocarditis, which is inflammation of the heart. Myocarditis can be mild, with symptoms such as chest pain and fever, but it can also develop into severe cases, leading to complete failure of the heart muscle and heart failure, which is a very serious illness. In these cases, the individual may experience tiredness, shortness of breath and a drop in performance in day-to-day activities.

In addition to myocarditis, Covid-19 is associated with an increase in the number of thromboembolic phenomena, i.e. it is a disease that is predisposed to forming clots. These clots can affect veins, leading to thrombosis, and affect arteries, leading to pulmonary embolism, myocardial infarction and stroke, which is ischemic stroke, depending on where the clot ends up. So, the sequelae of thromboembolic phenomena associated with Covid-19 are: heart attack, stroke, pulmonary embolism and thrombosis (ZANONI et.al, 2023).

According to Reis et al (2022), the cardiological sequelae of Covid-19 are basically: an increase in thromboembolic phenomena, with pulmonary embolism, stroke, thrombosis and heart attack; an increase in the number of hypertensive patients and myocarditis, which can progress to heart failure.

Covid-19 has two peculiarities in addition to inflammation that make it very aggressive for the cardiovascular system. It can cause direct damage to the heart cell, especially in its acute phase, causing myocarditis, an inflammation of the heart muscle. In addition, Covid-19 has a greater association with thrombosis, when a clot forms in the blood, hindering the flow of a blood vessel (ZANONI et.al, 2023).

According to Cortez (2023), vaccines to prevent SARS-CoV-2 infection are considered the most effective approach to controlling the virus pandemic. Despite the short timescales for the development of Covid-19 vaccines, each approved vaccine has gone through all the pre-clinical and clinical phases (phases I to III) of scientific research.

In 2022 Moreira et.al (2022) described that the same strict safety criteria to which these studies were subjected remain active and vigilant in the so-called "phase IV", or post-marketing monitoring. This phase is fundamental for assessing the occurrence of rare adverse events that are causally related to the vaccines, as they only become evident when they are applied to a large number of individuals.

For Gomes et.al (2022), they reported through their studies that a thromboembolic event occurs when a clot forms in the blood, impairing blood flow in the body.

According to Kawahara et.al (2022), it was during the Covid-19 vaccination period that the frequency of cerebral venous sinus thrombosis was found to be higher, as well as pulmonary embolism, splenic thrombosis and intracerebral hemorrhage. However, the benefits and risks of vaccines have been analyzed with various data available and recommendations have been approved, as well as official institutional and drug surveillance reports. In addition, evidence was found that vaccine-induced immune pro-thrombotic thrombocytopenia is suggested as a very

rare adverse event associated with viral vector vaccines and that mRNA vaccines are safe and should continue to be used.

In 2022 Moreira et.al (2022) described that the same strict safety criteria to which these studies were subjected remain active and vigilant in the so-called "phase IV", or post-marketing monitoring. This phase is fundamental for assessing the occurrence of rare adverse events that are causally related to the vaccines, as they only become evident when they are applied to a large number of individuals.

This corroborates the studies by Lopes et al (2022), who defined that as with other vaccines, adverse events were observed during this monitoring phase of population immunization programs against Covid-19, some related to involvement of the circulatory system.

Some studies have found that the disease has a high incidence and, although it is related to various factors, it was present in some cases of Covid-19 vaccination. Thus, the positive and negative impact of vaccination has become debatable. COVID-19 vaccines based on adenovirus vectors from Oxford/AstraZeneca and Johnson & Johnson have been associated with severe thromboembolic events combined with thrombocytopenia, called Vaccine-Induced Immune Thrombocytopenia and Thrombosis (FEITOSA et.al, 2020; GOMES et.al, 2022).

Some studies, such as those by Cesena et.al, (2021); Cortez et.al (2021); Avila et.al (2020), suggest that a pro-thrombotic syndrome has been described in a small number of individuals after being vaccinated. This syndrome has been named vaccine-induced thrombotic thrombocytopenia.

The studies by Rosano et al (2022), describe that although thrombosis is the clinical presentation in the majority of reported cases, isolated thrombocytopenia can also occur. Cerebral vein thrombosis is one of the most common forms of involvement described.

The prognosis depends on the territory affected, the extent of the thrombosis and resulting complications, and the time to diagnosis. In a series of 220 individuals, the mortality rate was 22% (ROSANO et.al, 2022; FEITOSA et.al, 2020; GOMES et.al, 2022).

Roncalli et.al (2021) cites in his published article that the factors identified that confer a higher risk of death include cerebral venous thrombosis, more pronounced thrombocytopenia and concomitant hemorrhagic complications. In the USA, the related mortality rate was 0.57 deaths per million doses.

Reis et al (2022) describes that, comparatively, the global mortality rate from Covid-19 is 1 to 2%. The incidence of thrombosis reaches 8% of all patients hospitalized with Covid-19, and up to 23% in individuals in intensive care units. In addition, there is evidence that the incidence of cerebral vein thrombosis in patients hospitalized with Covid-19 was 207 per million cases, much higher than the incidence of vaccine-induced cases (0.9 to 3.8 per million).

Thus, there is a consensus that the benefits of vaccination outweigh the potential risks of the vaccine's rare side effects (ROSANO et.al, 2022; FEITOSA et.al, 2020; GOMES et.al, 2022).

A previous history of venous thromboembolism (VTE) or a predisposition to VTE is not a contraindication to vaccination with any type of vaccine. No study has shown an increased risk or other thrombotic complications after vaccination in these individuals;

For individuals who have received a first dose of the vaccine and have not developed thromboembolism, the recommendation is to complete the vaccination schedule with two doses. There is no evidence that the second dose, or even the booster, increases the risk of thrombotic complications (ROSANO et.al, 2022; FEITOSA et.al, 2020; GOMES et.al, 2022).

For individuals who have had thromboembolism with an adenovirus vector vaccine, another dose should not be administered. It is recommended to transition the vaccine schedule to an mRNA vaccine. The available evidence does not support any clinical, laboratory or imaging evaluation in asymptomatic individuals before or after

vaccination (MOREIRA et.al, 2022; NASCIMENTO et,al, 2023; PILLAI, A., & LAWSON, 2022; ISHIGAMI et.al, 2021; KAWAHARA et.al,2020).

Final considerations

The adverse effects of Covid-19 vaccines are mild in most of the studies analyzed, they are common and do not pose any risk.

However, it was also mentioned that there is no vaccine or drug without any associated adverse effects.

Allergic reactions to one of the vaccine's components can also occur in more susceptible people. In such cases, a doctor's support is essential to determine what to do.

It has been mentioned that in the days surrounding the vaccination, the use of corticoids and anti-inflammatory drugs should be avoided, as they can alter the immune system's ability to generate an adequate response.

The use of any medication should be reported, as it can cause alterations in the immune system.

Symptoms of flu, colds or suspected covid-19 should also be reported. In these cases, the person must wait 15 to 30 days before being vaccinated. This rule also applies to the second dose.

Comments

All authors declare that there is no potential conflict of interest regarding this article.

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